El Yunque National Forest Fiscal Year 2008 Monitoring and Evaluation Report

Forest Supervisor's Certification

I have evaluated the monitoring results and recommendations in this report. I have directed the Forest Planner and Inventory and Monitoring Program Manager to develop an Action Plan to respond to the issues, concerns and opportunities that exist in order to evaluate the monitoring effectiveness. I have considered funding requirements in the budget necessary to implement these actions.

The Revised Forest Plan is sufficient to guide forest management for fiscal year 2008 unless ongoing monitoring and evaluation identify further need for change. Amendments or revisions to the Revised Land and Resource Management Plan will be made accordingly and as outlined by the National Forest Management Act (NFMA) and theNational Environmental Policy Act (NEPA) requirements.

Pablo Cruz

Forest Supervisor

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Introduction

A quality control review of El Yunque National Forest (EYNF) projects, activities, and practices was performed during the fiscal year of 2008. The Monitoring Evaluation annually supervises and assesses its programs and projects to determine progress toward achieving the Revised Forest Land Management Plan (LMP) goals, objectives, and standards and guidelines.

Monitoring and evaluation is an ongoing process, documented through annual reviews by the Forest Supervisor and Forest staff. Monitoring indicates whether a management direction in the LMP is being effectively carried out and points out needed modification of that direction. It also shows whether effects of implementing the LMP are occurring as predicted; whether the applications of management action respond to public issues or management concerns; and the costs of implementing management strategies.

This 2008 report is structured to correspond with the monitoring direction in Chapter 5 of the LMP. Information for each monitoring element includes: an introduction, program implementation, program effectiveness, and conclusion that states if desired conditions are met and if actions comply with the LMP.

The fiscal year of 2008 was one of stability. Most programs executed their respective goals with precision and met their goals and objective. Though the majority of the divisions did comply with the LMP standards, some were obstructed by natural hindrances or administrative obstacles.

The Soil and Water program is one which requires further monitoring. Though it complies with the goals of the LMP, the manner in which watershed is approach may become troublesome, even more since the water extraction off the Forest, threatening the hydrological linkages, is increasing. If it is not paid adequate attention, complications will arise and the Soil and Water program may suffer problems which will obstruct the Forest's productivity.

There are also some discrepancies in the animal populations that should be addressed. Even if the aquatic ecosystem of the Forest has a healthy stasis, many populations are not increasing such as the Puerto Rican Parrot and both the Sharp-shinned and Broad-winged hawk (the population stability for the hawks is uncertain). The Coqui populations, as well as other amphibians, are threatened by the rapid movement of a new chytrid fungus. These animal populations should be assessed and monitored further in hopes of maintaining balance and stability.

One of the main problems of the fiscal year was administrative budgeting. Because of the lack of funding, the efficiency of the Recreation, Lands, Special Uses and Transportation programs was decreased and the DFC's of LMP were not met. Though the Air Program does not receive funding whatsoever (making it unable to adhere to LMP standards) and it is not a management priority, it should be considered for restructuring in the future as it

will become useful. Future funding should be considered for programs that depend on capital to function.

The Volunteer Program has made great contributions in accomplishing EYNF work priorities for FY 2008. We received assistance of 898 volunteers for an appraisal value of 180,184. And 8511.5 accumulated hours rendered.

Other programs are working toward LMP standards. The Recreation program, although the lack of maintenance suffered this year hindered productivity, strives towards its DFC just as the Law Enforcement program. Both areas suffer the impact of high visitation periods which impact resource opportunities and experience.

Besides the problems concerning a few programs, others were extremely successful. The Research program was able to amass vast data, furthering Forest research and knowledge, as well as accomplishing a wide array of academic activities. The Pest Management program fared extremely well, not only meeting LMP standards for pest control but USDA levels as well.

Aside from the aforementioned programs, all the other projects met their individual LMP standards and guidelines. No major administrative change or overhaul should be considered since most programs are functioning properly. Only monitoring and slight revising should be considered for the programs that are not achieving their DFC

Primary Forest

Introduction

The Primary Forest Program aims to preserve and protect primary forest areas. The goal of the LMP is to protect areas and keep it forested with native species.

Program Implementation

The Primary Forest Program is implemented through monitoring conditions of primary forest and the advanced growth in secondary forest. Visual inspection of primary forest is used to determine acres altered by trail construction or other development. To monitor the protection of primary forest; land use permits are controlled to ensure use does not impact the Forest. The Desired Future Condition (DFC) of the LMP is that primary forest is protected and that acreage of primary forest is not reduced.

Program Effectiveness

There have been no negative impacts on primary forest, nor any type of construction occurred during fiscal year 2008.

Conclusion

The Primary forest is protected and the program complies with the goals, standards and guidelines of the LMP of EYNF.

Rare Plants

Introduction

The Rare Plants Program identifies and protects proposed, endangered, threatened, sensitive plants (PETS). The program goals are achieved by surveying, identifying, propagating and maintaining population stability.

The program is a monitoring item in the LMP. The existing population status, identification of new populations, and the success of propagation and reintroductions are monitored annually.

Program Implementation

DFC is that populations of PETS are stable or increasing. Surveys of known populations are conducted every two years during flowering and fruiting seasons. Reconnaissance for new populations is also implemented.

Program Effectiveness

The program has been efficient in both protecting and aiding population growth. The program has shown that although populations of sensitive species are increasing by means of introduction to the Forest generated seedlings at the nursery, the reconnaissance surveys have not produced new populations of PETS during the FY09 and all known populations of PETS are stable.

Moreover, two seedlings of *Callicarpa ampla* (produced by air layering) where incorporated to the surroundings of the *Callicarpa ampla* present at *El Portal* to initiate a population. Also, more than a 100 fruits of *Callicarpa ampla* were collected. Their seeds where cleaned, dried, and stored for future germination efforts.

Furthermore, the Rare Plants Program has completed additional events such as:

- Acquiring the US Fish and Wildlife Service permit for *Styrax portoricensis* seed collection and cultivation.
- Collaborating with the Puerto Rico Conservation Trust nursery and seed orchard as well as the Universidad de Puerto Rico, PR Department of Natural and Environmental Resources, and the Puerto Rico Conservation Trust to improve the ability to reproduce and introduce species.
- GIS mapping of federally listed species.
- Donating five *Styrax portoricensis* to Carite State Forest, DNER, twenty *Pleodendrum macratum* to Rio Abajo State Forest, DNER, and five *Styrax* to Parque Dona Ines from the Fundación Luis Munoz Marin for planting at their Metropolitan Urban Forest in 2006.
- Planted two individuals at El Jardin Botánico, Universidad de Puerto Rico, Rio Piedras.
- Volunteers and students assisted in plant propagation.
- Participating in the parrot NEPA.

Species	Measurement or Management Action	2003	2004	2005	2006	2008
Styrax portoricensis	Existing Population Status Surveys	9 individuals		9 individuals		
Styrax portoricenis	Propagations and Introductions	6 germinated			10 propagated Bearing fruits at Canyon San Cristobal	5 individuals donated
Callicarpa amplia	Propagations and Introductions	2 air layered			100 seeds collected and stored. 2 seedlings planted	2 seedlings
Tourtugo prieto	Propagations and Introductions	4 cuttings				
Eugenia haematocarpa	Propagations and Introductions	6 wildlings	10 seedlings			4 individuals donated
Ravenia urbanii	Identification of New Populations		1 population			
Ravenia urbanii	Propagations and Introductions		285 wildlings			4 individuals donated
Brusenfalia portoricensis	Identification of New Populations		1 population			
Brusenfalia portoricensis	Propagations and Introductions		82 seedlings 5 wildlings			5 individuals donated
Pleodendrum macrantum	Propagations and Introductions		157 seedlings			5 donated and 5 planted

Conclusion

Recovery goals for PETS are continuously in process and in compliance with the LMP goals.

Wildlife and Fisheries

Introduction

During 2008, the biological staff of the EYNF conducted their yearly survey of management indicator species (MIS) habitats and population trends. This report documents the continuing work of the biological team's efforts in meeting the intent of the LMP for the EYNF.

Coarse/Fine Filter Approach
The framework for conserving biological diversity uses the *coarse/fine filter approach*, which holds that a strategy focused on maintaining the composition, structure, and function of a system as a whole will be adequate to meet the needs of most species. The mesh of the coarse filter captures a wide range of environmental conditions at landscape and land unit level. In contrast, some species have additional needs or narrower habitat requirements that are not adequately met by focusing solely on the system as a whole. Under these circumstances, additional fine filter measures are needed to catch and support the necessities of certain species whose needs would have gone unmet otherwise.

Goals, objectives, standards, and management area designations in Forest Plans provide the coarse filter. The fine filter is provided by evaluating proposed endangered, threatened and sensitive (PETS) species at both the Forest Plan scale and project scale. Standards in the Forest Plan provide fine filter protection by limiting where actions that may affect these species occur. Mitigation measures at the project scale provide further fine filter protection to safeguard TES, thus maintaining diversity for species that have narrow habitat requirements.

Program goals are:

- Attaining sustainable populations of native species
- Emphasizing non-consumptive uses of wildlife
- Participating actively in the population protection and habitat stewardship of PETS species
- Facilitating interagency coordination
- Providing special protection for limited and sensitive habitats
- Integrating the knowledge and technology of the Forest's Rare Plants, and Wildlife and Fisheries program with international assistance throughout the Caribbean and Latin American

Program Implementation

The programmatic desired condition is to maintain viable populations of native flora and fauna, including PETS species. Better understanding of forest species' ranges, distributions, population characteristics, limitations, and their habitat requirements. Surveys are attempted annually.

Program Effectiveness

The desired conditions for the wildlife and fisheries program as stated in the EYNF forest plan are:

- Having the Puerto Rican Parrot, Elfin woods warbler, Coqui, the Forest's neotropical bird populations as well as populations of non-PETS management indicator species remain stable or increase.
- Having the Sharp-shinned and Broad-winged hawk populations increase
- Maintaining in-stream flows at sufficient levels to maintain healthy aquatic ecosystems.
- Meeting recovery goals for Proposed, endangered, and threatened (PETS)

The Wildlife and Fisheries program FY09 accomplishments include:

- Collaborating with US Fish and Wildlife Service and Puerto Rican Department of Natural and Environmental Resources on the Puerto Rican Parrot recovery.
- Conducting breeding bird and Audubon's Christmas bird surveys but also conducted MIS lizards and endangered boas as well as fisheries surveys.
- Completing both biological and environmental assessments
- Collaborating with Sierra Club volunteers in trail rehabilitation
- Reinitiating the United Nations' Hydrology for the Environment, Living and Policy (HELP
- Participating in the Youth Conservation Crops.

Species	Management threshold	2008
Amazona vittata Puerto Rican Parrot	Population stability	25-30
Accipiter striatus striatus Sharp-shinned hawk	Population stability	None observed in both bird surveys
Buteo platypterus brunnescens Broad-winged hawk	Population stability	1 documented in breeding bird survey
Dendroica angelae Elfin-woods warbler	Population stability	1 documented in breeding bird survey
Dendroica caerulescens Black-throated warbler	Population stability	None observed in both surveys
Anolis gundlachi Yellow-bearded Anole	Population stability	Multiple documented in lizard surveys
Eleutherodactylus hedricki Tree-hole coqui	Population stability	No surveys conducted
Eleutherodactylus locustus Warty coqui	Population stability	No surveys conducted
Eleutherodactylus unicolor Burrow Coqui	Population stability	No surveys conducted
Sicydium plumieri Goby	Healthy aquatic ecosystems	Multiple documented in Quebrada grande survey
Agonostomus monticola Mountain mullet	Healthy aquatic ecosystems	None observed in Quebrada Grande survey
Macrobrachium carcinus River shrimp	Healthy aquatic ecosystems	Individuals documented in Quebrada Grande survey

Due to the vast amount of presence/absence data, graphs were not developed for this monitoring and evaluation report. The total dataset is being prepared for an upcoming forest plan revision. If interested in the data for fiscal year 2008 please contact: Forest Biologist, El Yunque National Forest, 787-888-1810 or fcano@fs.fed.us

Conclusion

Though in-stream flows appear to be sufficiently maintaining a healthy aquatic ecosystem, some population indices are unstable such as that of neotropical birds. The Coqui populations are also unstable and should be paid attention because the rapid movement of *Batrachochytrium dendrobatidis,* the chytrid fungus, on the EYNF is alarming and may have long-term effects on amphibians. Additionally, the population of another non-PETS management indicator species, the anole lizard, appears to exhibit small degrees of fluctuation. There are fluxes between years on the observation of individual species. Although the EYNF management has not changed significantly in the last decade, there is speculation of a change in a global scope.

Some populations in the EYNF are not increasing. The Puerto Rican Parrot is one of those, but it remains stable without certainty. The wild flock at EYNF seems to either have met with an unexpected population limiting factor. With predation studies being conducted by the U.S. Fish and Wildlife Service the parrot recovery effort can gauge whether the red-tailed hawks effects are the main factor in wild flock growth. The population of both Sharp-shinned and Broad-winged hawk are not increasing as well. This population's stability is uncertain.

Furthermore, the Elfin woods warbler is presently going through a conservation assessment agreement between the EYNF and US Fish and Wildlife Service due to the lack of presence in its range.

Integrated Pest Management

Introduction

The goal of integrated pest management in the Land Management Plan (LMP) is to prevent damage and losses and reduce pests to levels that are economically, environmentally, and esthetically acceptable. Current invasive species found in EYNF are terrestrial animals and non-native invasive plants.

Program Implementation

The mongoose removal strategy will be applied when "problem" animals, individuals that appear to have become habituated to seeking food from humans, are found in recreation areas.

Many exotic animal species have become established in Puerto Rico, posing varying degrees of threat to native species island-wide and within the Forest. For example, the common iguana (*Iguana iguana*) of Central and South America has become very common in coastal Puerto Rico.

The honeybee is also an introduced undesirable species in developed recreation areas and is a major problem for the Puerto Rican Parrot recovery effort. The recent arrival in Puerto Rico of the more aggressive Africanized honeybee has aggravated the situation.

Other pest management activities related to parrot recovery includes rat and pearly-eyed thrasher control. The thrasher is a competitor of the parrot, and a potential predator of parrot nestlings. Thrasher management strategy consists of providing them two nest boxes near parrot nests so that thrashers won't disrupt the larger cavities the parrots need, while also delimiting the territory around the nest they defend against other thrashers.

Program Effectiveness

Species	2008
Small Indian mongoose (*Herpestes javanicus*)	95 captured in live traps
Rat species (Rattus rattus & Rattus norvegicus)	13 captured in live traps
Feral cat (Felis silvestris catus)	6 captured in live traps
Africanized bees (Apis mellifera scutellata)	2 nests treated

Mongoose and Rat species:

The control of these continually adapting mammals has been one of the most challenging obstacles in the attempt to move the Forest to a more original state. After conducting multiple studies on distributions, population dynamics and different capture protocol the conclusion is that the mongoose and rats will have populations throughout EYNF that will rise and fall through local migration. This is of interest due to the fact that the two species are a vector for diseases that pose a threat to human health. The seasonal flux in mongoose occurrences, for example, in different locations reveals the importance of public education and preparation for field-going Forest personnel. The two species are destructive against young Puerto Rican Parrots that are not able to fly and are attacked on the ground. The loss of one of these young endangered birds hinders the recovery program of these species. The current humane trapping and processing of the mammals has recorded the evolving policy of pest animal treatment and remains the most responsive program on the Forest.

Feral Cats & Dogs, Iguanas:

With the encroaching of human development to the Forest, the unit has been called upon to reports of wild, formerly domesticated, cats and dogs. Data shows that the Forest is seen by the public as a humane alternative for unwanted pets and releasing them there gives the pet owner the idea that the animal will be taken care of. Most of the time, the animal becomes malnourished and develops a whole range of health issues, which usually ends in a prolonged death. These events are spread throughout the year, but through an awareness campaign fewer specimens have been seen. The feral animals are usually found at developed recreational sites or on major roads on the Forest.

Africanized Bees:

The honeybee, which is one of the main competitors of the Puerto Rican Parrot for nesting cavities, has been kept at controllable levels. The social insect species are very opportunistic, so monitoring vacated parrot nest cavities are immediately placed out of commission. The trend for the population is stable with no signs of going either up or down.

Vegetation Species:

There are several vegetative species present in the Forest with an opportunistic invasive behavior. They may become invasive or pests under certain environmental circumstances (id. est. hurricane defoliation, fire, land clearing and landslides). Usually the great diversity of plant species at El Yunque NF masks their presence and/or limits colonization of forest environments.

Active collaboration with APHIS and Plant Health Program of the Puerto Rico Department of Agriculture in early detection of vegetation detrimental insects, like the Pink Hibiscus Mealy bug and the Red Palm Mite has rendered excellent sanitary results by monitoring the surrounding lands of El Yunque NF and reporting to these two agencies the presence of the insects in areas outside Forest boundaries but with potential migratory access to EYNF. Biological control of the pink hibiscus has been very successful and there is an interagency team working on data gathering and alternatives in managing the problem before it becomes a serious island wide pest situation. There has not been an infestation of the Forest environment from these two insects during the last 5 years. Monitoring for detection is an ongoing yearly activity.

<u>Plant Species</u>

Non- Native Invasive Plant (NNIP) Species:

In January 2008, an invasive plant survey of El Toro Wilderness was conducted and documented in the NNIP Management Plan. Areas surveyed included Tradewinds Trail, Rio Sabana Trail, and roads along the wilderness boundary: Rd. 191, Rd. 186, and Rd. 9966 (Jimenez). Findings concluded that there are 81 invasive plant species in El Yunque National Forest and 19 top priority species that pose a threat to the wilderness character (figure 1). Alternatives were evaluated and prescribed. A NEPA analysis would have to be completed before any further management action. Alternative 1 was no treatment; alternative 2 was manual removal, and alternative 3 involved chemical controls. Recommendations were made for the top priority species found in El Toro Wilderness.

Figure 1:

Invasive Plant List of El Yunque National Forest
2008
*** Forest high priority species are highlighted**

CODE	GENUS	SPECIES	COMMON NAME	STATUS	FORM
ADPA	Adenanthera	pavonina	red bead tree	ex	small tree
ALLE	Albizia	lebbeck	woman's tongue	natu	small tree
ALECT2	Alectra		alectra / Yerba de hierro	ex	herb
ALPH	Alternanthera	philoxeroides	alligatorweed	ex	weed
ALSE4	Alternanthera	sessilis	sessile joyweed	ex	weed
ARAL7	Artocarpus	altilis	breadfruit	natu	tree
BAVA	Bauhinia	variegata	poor's man orchid	natu	small tree
CAAN22	Calophyllum	antillanum	Antilles calophyllum	nat	tree
CAEL5	Castilla	elastica	Panama rubbertree	ex	tree
CAEQ	Casuarina	equisetifolia	Beach sheoak	ex	tree
CEDI6	Cestrum	diurnum	day jessamine	nat	shrub
COES	Colocasia	spp.	coco yam	ex	herb
COBE2	Commelina	benghalensis	Jio	ex	grass
CUSCU	Cuscuta		dodder / fideillo	nat	vine
CYIN6	Cyperus	involucratus	umbrella plant	ex	sedge
DIRU2	Dicranopteris	pectinata	tropical forkedfern	nat	fern
DIVE2	Digitaria	velutina	Velvet crabgrass	nat	grass
DIAL2	Dioscorea	alata	Water yam	natu	vine
DIBU	Dioscorea	bulbifera	air yam	natu	vine
EIAZ2	Eichhornia	azurea	anchored water hyacinth	nat	herb
EICR	Eichhornia	crassipes	common water hyacinth	ex	herb
STBI5	Gleichenia	bifida	Mexican umbrella fern	nat	fern
HECO11	hedychium	coronarium	White Butterfly lili, Genjibre oloroso	natu	forb/herb
HEFL5	hedychium	flavum	Yellow Butterfly lili	natu	forb/herb
HITI	Hibiscus	tiliaceus	sea hibiscus / emajagua	natu	small tree
HYPO3	Hygrophila	polysperma	Indian swampweed	nat	grass
HYAM2	Hymenachne	amplexicaulis	West Indian marsh grass	nat	grass
IMBR	Imperata	brasiliensis	Brazilian satintail	nat	grass
IPAL	Ipomoea	alba	tropical white morning-glory	nat	vine
IPAQ	Ipomoea	aquatica	swamp morning-glory	ex	vine
IPBA2	Ipomoea	batatas	sweetpotato	nat	vine
IPCA5	Ipomoea	carnea	Gloria de la manana	nat	vine
IPHE2	Ipomoea	hederifolia	scarletcreeper	nat	vine
IPNI	Ipomoea	nil	whiteedge morning-glory	nat	vine
IPOC2	Ipomoea	ochracea	Fence morning-glory	natu	vine
IPPU2	Ipomoea	purpurea	tall morning-glory	nat	vine
IPQU	Ipomoea	quamoclit	cypressvine	nat	vine
IPRE	Ipomoea	repanda	bejuco colorado	nat	vine
IPSE2	Ipomoea	setifera	bejuco de puerco	nat	vine

IPTR2	Ipomoea	triloba	littlebell	nat	vine
IPTR3	Ipomoea	tricolor	grannyvine	nat	vine
IPVI	Ipomoea	violacea	heavenlyblue morning-glory	nat	vine
LACA2	Lantana	camara	lantana	nat	shrub
LELE10	Leucaena	leucocephala	white leadtree	nat	shrub
LYJA	Lygodium	japonicum	Japanese climbing fern	ex	fern
MAUN3	Macfadyena	unguis-cati	catclawvine	nat	vine
MEQU	Melaleuca	quinquenervia	punktree	ex	small tree
MEMI2	Melinis	minutiflora	molassesgrass	ex	grass
MERE9	Melinis	repens	rose Natal grass	ex	grass
METU2	Merremia	tuberosa	Spanish arborvine	nat	vine
MIMI5	Mikania	micrantha	bittervine	nat	vine
MIPE2	Mimosa	pellita	lollipop mimosa	nat	weed
MIPE3	Mitreola	petiolata	lax hornpod	nat	herb
MUEX2	Murraya	exotica	Chinese box	ex	shrub
NECO3	Nephrolepis	cordifolia	narrow swordfern/ fishbonefern	nat	fern
NEMU	Nephrolepis	multiflora	Asian swordfern	ex	fern
OEMA2	Oecoeclades	maculata	Monk orchid	nat	ground orchid
PAFO2	Passiflora	foetida	fetid passionflower	nat	vine
PECL2	Pennisetum	clandestinum	kikuyugrass	ex	grass
PEPU2	Pennisetum	purpureum	elephant grass	ex	grass
PIST2	Pistia	stratiotes	Water lettuce	nat	herb
PUPH2	Pueraria	phaseoloides	tropical kudzu	natu	vine
RICO3	Ricinus	communis	castorbean	natu	shrub
SASP	Saccharum	spontaneum	wild sugarcane	ex	grass
SAAU	Salvinia	auriculata	Eared watermoss	nat	herb
SAHY2	Sansevieria	hyacinthoides	iguanatail	natu	herb
SCAC2	Schefflera	actinophylla	octopus tree	ex	tree
SEPL3	Selaginella	plana	Asian spikemoss	ex	fern
SEWI	Selaginella	willdenowii	Willdenow's spikemoss	ex	fern
SOJA3	Solanum	jamaicense	Jamaican nightshade	nat	shrub
SOTO4	Solanum	torvum	turkey berry/ berenjena cimarrona	nat	shrub
SPCA	Spathodea	campanulata	African Tulip	natu	tree
SPTR6	Sphagneticola	trilobata	Bay Biscayne creeping-oxeye	nat	shrub
SYPO	Syngonium	podophyllum	American evergreen	natu	vine
SYJA	Syzygium	jambos	Malabar plum	natu	small tree
TEIN	Tectaria	incisa	incised halberd fern	nat	fern
TECA	Terminalia	catappa	tropical almond	natu	tree
THPO3	Thespesia	populnea	Portia tree	ex	tree
TRSP8	Tradescantia	spathacea	boatlily	nat	shrub
TRPR5	Tridax	procumbens	coatbuttons	nat	shrub
URLO	Urena	lobata	ceasar weed/ cadillo	nat	herb
URMU	Urochloa	mutica	para grass	nat	grass

The following describes the actions proposed in 2008 to address the following invasive plants identified in the El Toro Wilderness Area

1. *Hibiscus tiliaceus* (Emajaguilla or Sea Hibiscus):
    - Use minimum alternative #2 in site specific locations such as the El Toro trailhead and beginning of El Toro trail where this plant is overgrown and has blocked the trail. Monitor and follow up success of treatment.
    - Dispose plant material properly (since this plant can self propagate by cuttings) and monitor roads near wilderness boundary where this plant has been identified, (rd. 186). Ensure road maintenance disposes of cut plant material properly, never near or inside wilderness areas.

2. *Dicranopteris pectinata* (Tropical Forkedfern) and *Gleichenia bifida* (Mexican Umbrellafern):
    - Monitor and survey plant population especially in areas of highest priority and areas like trails and trailheads and after disturbances such as storms, hurricanes, and landslides.
    - Use minimum alternative #2 in site specific locations, possibly around Tradewinds trailhead, on landslides outside the wilderness boundary to test treatment success before implementing this control method inside the wilderness.

3. *Hedychium coronarium* (Gengibre Oloroso):
    - Closely monitor population growth and dispersal of this plant since during the preliminary survey of rd. 191 this plant was thriving around the Tradewinds trailhead, but not found inside the wilderness area.
    - Possibly use alternative #2 in site specific location (Tradewinds trailhead) to prevent further spread of this plant into the wilderness.

4. *Selaginella willdenowii* (Willdenow's Spikemoss)
    - This exotic fern is one of the most aggressive species. According to the data collected in 2008 and 2008, it grows about 4 meters per year. The closest distance of the infested road site to the wilderness is 113 meters; at this rate it would take about 28 years for this plant to enter the wilderness.
    - Closely monitor population growth and dispersal in infested sites along rd. 186 and the large approximately 5 acre patch that extends into the wilderness buffer zone (off rd.186, about 1.5 miles east from km.20, along Sonadora Creek). Also monitor infested site on rd. 191, right after intersection 9966.
    - Use alternative #2, in site specific locations and monitor success of treatment, if treatment proves effective proceed to treating all infested sites with alternative #2

If treatment is unsuccessful and infestation intensifies, displacing native vegetation, consider a combination of alternative #2 and #3. A NEPA analysis will have to be completed before implementation of chemical control.

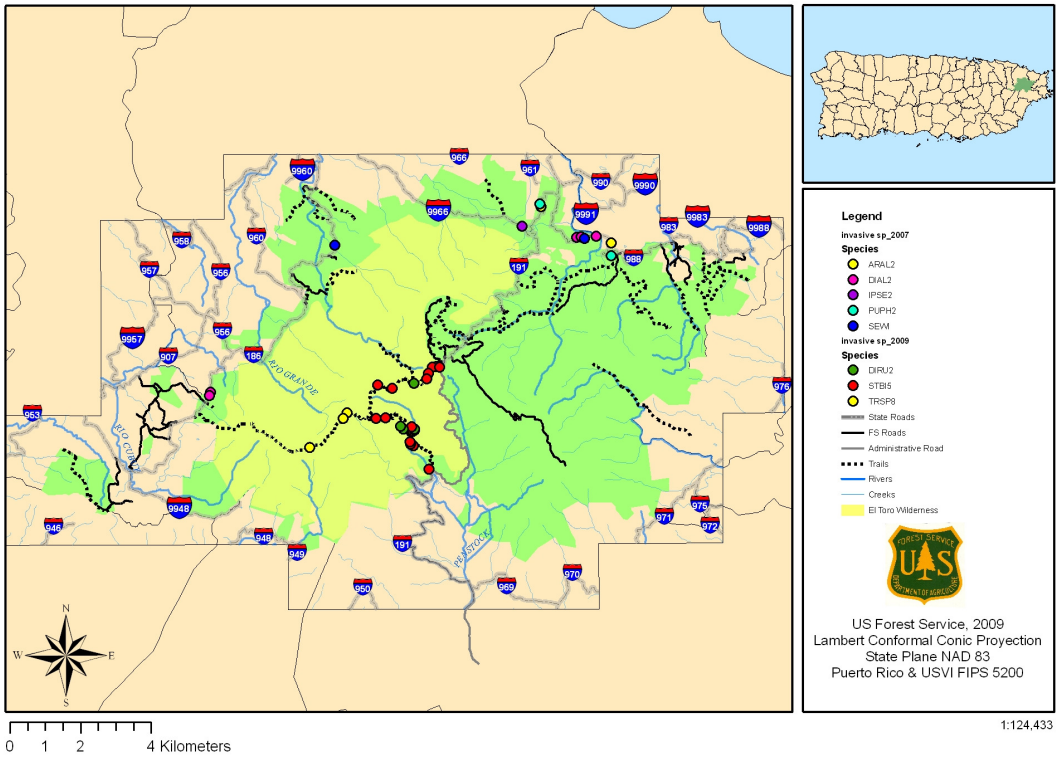
5. All listed Non Native Invasive Plants of High Priority:

- Use Alternative #1
- Monitor/survey inside El Toro Wilderness and high priority areas such as trails, trailheads, parking lots, and roads along the wilderness boundary.

6. All other listed Non Native Invasive Species:

- Use Alternative #1
- All *Ipomoea spps*. (Morning Glory species) and *Pueraria phaseoloides* (Tropical Kudzu) should be monitored after intense storms or hurricanes. If an infestation is present, use alternative #2.

Invasive Plants Inventory 2009



Conclusion

The DFC set forth in the LMP is still current and viable. Concerning the terrestrial species, there is no need for change in management direction and the program meets not only El Yunque NF policy, but also the USDA Animal and Plant Health Inspection Service-Animal Services protocol and policy.

Significant changes in policy occurred during the last five year period. First, the Agency has identified invasive species as one of the four critical threats to our Nation's Forests. Second, Regional strategy was established in 2003. Third, El Toro Roadless area was designated as Wilderness in 2005. The designation creates new challenges to meet the Desired Future Condition by imposing limitations on invasive plant/noxious weeds treatments due to the Wilderness Act.

The Forest adapted its field data sheet using the National Invasive Weeds Data Protocol and completed a new field guide. Monitoring activities were initiated in 2003. Though conditions are met, two new issues have emerged in the last several years. Firstly, there is an imperative to work cooperatively to identify invasive species (including noxious weeds) problems and develop control programs, and secondly, there is a concern on the effect of climate change on plant associations, natural succession and primary forest.

Soil and Water

Introduction

The DFC for the Soil and Water Program, as described in the LMP, states:

"Clean water flows from the Forest. The Forest's healthy watershed condition, water quantity and quality, and soil productivity are maintained. Rivers arising on the Forest provide dynamic links for the aquatic life of Puerto Rico's eastern mountains and the sea. Use of water for human consumption is balanced within in-stream flow needs for recreation, research and aquatic and terrestrial ecosystem maintenance. Aquatic ecosystems remain healthy, watershed condition is restored, enhanced, or maintained, rivers provide dynamic links, water used and development is balanced."

Program Implementation

Three conditions comprise the DFC for soil and water resources; healthy watersheds, rivers dynamic links, and the balanced use of water. The Forest Service measures performance towards sustaining a healthy watershed condition in acres needing restoration or maintenance. The number of acres restored depends on funds received, which are based on field inventories. Inventories are influenced by natural forest conditions and tropical storm events. The balanced consumptive use is measured by the number of intakes and estimates of water extracted from the Forest.

The Forest aims to provide water while protecting the hydrological integrity and aquatic life. The Forest streams are located in the headwaters of the Luquillo Mountain Range. The number of intakes in the lower drainages of the mountain range and amount extracted are significant elements when considering river continuity. Un-managed water recreation, erosion and sedimentation, and poisoning can affect water quality.

Researchers document that water use continues to be the same: extraction, recreation, ecological integrity, and biodiversity (Crook et al., 2007). Programmatic events are useful indicators of actions towards meeting goals of the Land Management Plan. The existing conditions and trends were summarized in the following table.

DFC	Measurement or Management Action	2003	2004	2005	2006	2008
Healthy Watershed	Acres restored	9	8	15	7	12
Healthy Watershed	Acres affected by illegal use	0	0	0	8	1.5
Balanced Water Use	Extraction	51 mgd	66.4 mgd	66.4 mgd	66.4 mgd	66.4 mgd
Balanced Water Use	Intakes	32	34	36	36	36
Dynamic Links	Flows	Not below natural minima	Not below natural minima	Not below natural minima	Not below natural minima	Not below natural minima
Plan Goals	Number of programmatic events	6	8	8	7	3

Watershed Restoration Project in Arroyo FY 08:

Arroyo is a 161-acre tract within compartment 13 ("El Negro") in the Rio Canovanas watershed. Its primary uses emphasize forestry research (dispersed recreation comes second). However, visitors are contributing to unmanaged recreational Off Road Vehicle (ORV) use.

The Arroyo tract has approximately one kilometer of unpaved primitive non designated road. There are 1.5 acres of affected area. ORV activities have caused soil compaction, tree mortality, erosion, and sedimentation. All erosion produced drains into Rio Canovanas. Gullies up to six feet deep were found to be caused by illegal use of four-tracks and motorbikes in rainy conditions and on wet soils. Soils are compacted and denuded of vegetation. Rain surface run-off is producing a considerable amount of clay sediment that drains into the tributaries of Rio Canovanas. There is a need to mitigate and correct the problems associated with the current conditions in the Arroyo tract. This

can be done through road closure (making the area inaccessible to ORV's), stream corridor restoration, and reintroducing vegetation.

There are two access points to the tract in use, which are the south and east side of Arroyo Tract. The north side has no access and the west side (coming from Road 907) has been abandoned and vegetation has covered the access to secondary forest. The east side is accessed from Road 186 Km 11.8 (this access is in private lands, basically a neighbor-less area) and the south side is accessed via Road 186 Km 9.8 towards Sandoval and then towards the access to Finca Santa Rosa (a flower production farm adjacent to that access point)

From an interview with a worker of the Finca Santa Rosa, the visitors seem to be an organized group from the area of Carolina that may be using "La Condesa" Tract also as part of their muddy circuit. Their favorite days are Saturdays and Sundays, particularly if they are rainy. More than the cross country ride it seems they like the muddy challenge experience. Being license plate free vehicles, they must be transported to an arrival and depart spot by other authorized vehicles.

Soil Compaction due to off road vehicle use.

Gully due to off road vehicle use.

Gully formation on an old road.

Road damage.

Additional watershed program events completed include:

- Aiding with technical assistance the development of Wild and Scenic River Environmental Assessment and Plan and the East Peak Oil Spill.
- Completing the Certification of Forest Soil Survey
- Participating in United Nations Educational, Scientific, and Cultural Organization (UNESCO) Hydrology, Environment, Life and Policy (HELP) of Luquillo Mountain Range
- Collaborating on the Fisheries Population and Habitat Assessment of P.R. Streams by the Zoology Department, North Carolina State University, University of Pennsylvania Hydrology Research Program and FS Pacific Northwest Research Station on water use for recreation.
- Participating in the United Nations (UN) World Water Day with Universidad del Este and Universidad Interamericana
- Supporting the U.S. Geological Survey management of permanent station.
- Adding technical input to special use permits.

There is a trend towards balanced management of water resource use. In 2002, the Forest had 34 permitted intakes. Six new points of water withdrawal have been added on rivers draining EYNF on and off-forest. Four intakes have been added within the forest in Rio Espiritu Santo and Rio Grande. Two intakes have been added outside the forest in Rio Fajardo and Rio Blanco. This results in an increase extraction of 15 million gallons per day (mgd) (Crook et al., 2007).

The geomorphic integrity and drainage stability combined with improvement to physical conditions of uplands, riparian areas and aquatic systems after Hurricane Georges, Tropical Storm Jeanne and one un-named event, demonstrate resilient river dynamics.

Finally, budget and staffing levels influence the ability to work towards desired condition. The forest received funds ranging from $ 77,000 to $ 86,000. The annual budget of the Watershed Program was $ 80,000, but it was supplemented by specific restoration funds of $ 38,000 to restore watershed conditions after illegal off road vehicle destruction. Hydrology services were reduced to 15 % of a full time specialist. The forest water special use permit returns $ 500.00 dollars to the U.S. Treasury. The estimated withdrawal on streams draining the Forest is 66.4 mgd. The market value of water produced by the forest is $ 8,320,000 million using the Energy Evaluation of Luquillo Experimental Forest as index (Odum, 2000).

Program Effectiveness

The trend analysis shows that the DFC for watershed is appropriate for the management situation of the Forest. During the 5-year period, we conclude that we worked towards meeting goals. However, recent changes in water extraction off-forest threaten hydrological linkages.

Significant changes in policy occurred during the five year period. First, Rio Icacos and Rio Mameyes were designated as Wild and Scenic Rivers. Second, El Toro Roadless area was designated as Wilderness. These legal actions will affect the effort to meet the desired conditions as follows:

- It eliminates the possibility of constructing intakes on 10,000 acres of Wilderness; thus, reducing the capacity of the Forest to issue Water Use Permits.

- It imposes restrictions on soil and water improvement project due to Wilderness Act implementation; thus, reducing capacity to implement a project that restores the healthy watershed conditions in Rio Espiritu Santo.

- It facilitates water and soil conservation on stream banks of Rio Mameyes and Rio Icacos.

- It encourages local government to enact rules and regulations that protects areas off-Forest.

Moreover, the Environmental Protection Agency included Rio Espiritu Santo and Rio Fajardo in the listing of impaired watersheds (EPA, 2008).

A new water budget was published in 2007 (Crook et al., 2007). The report mentions four new intakes within the Forest and two outside the Forest. These intakes are located in Rio Mameyes, Espiritu Santo, Blanco and Fajardo. The new budget estimates withdrawal from streams draining EYNF at 66.4 mgd. This is an increase from 51.0 mgd estimated in 1994. The current public demand is estimated at 67 mgd. 11% of the runoff is diverted for human use. However, the majority of runoff occurs during storm events; which makes this 11 % an underestimate of the ecological effect on stream flow.

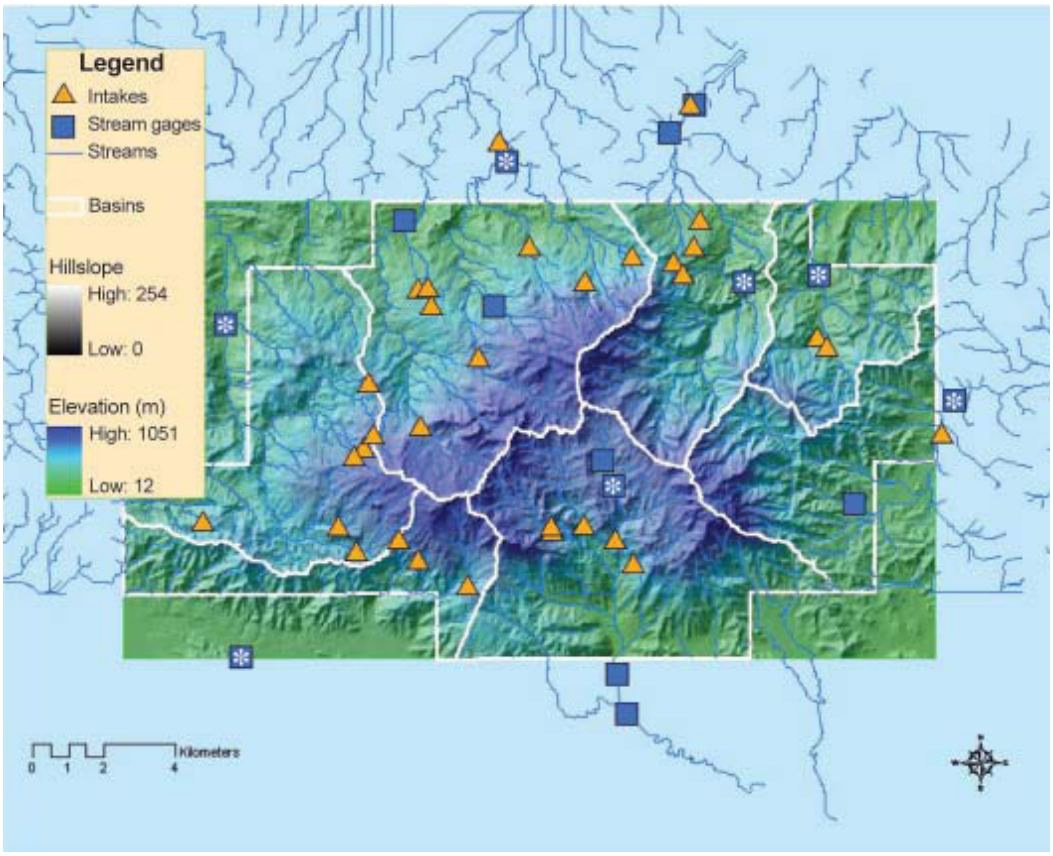


Figure1 —U.S. Geological Survey stream gages. Watersheds, clockwise from the left, bottom corner of the Luquillo Experimental Forest are: Gurabo, Canóvanas (Loíza), Espiritu Santo, Mameyes, Sabana, Fajardo, Blanco. Source: Crook et al., 2007.

Conclusion

The threat to river continuum is emerging. The Soil and Water Program complies with the LMP, but management issues in the Forest regarding watershed are intensifying as water extraction off the Forest is increasing.

Air

Introduction

The Air Program's DFC is that air quality be maintained and continue to be valued by visitors and residents as one of its most valuable resources. Air quality must be preserved to ensure public health and the Forest's biological, recreational, and scenic values.

Program Implementation

The Forest does not monitor air quality. One of the goals in the LMP is to monitor the effects of air pollutants and atmospheric deposition on Forest resources. Currently there are no major emitting industries in Eastern Puerto Rico. The Puerto Rico Environmental Quality Board (EQB) published results on air quality station EQB#22 located in Fajardo, Puerto Rico from 2003 to 2006. There was no air quality survey information available FY2007- 2008.

Pollutant	2003	2004	2004	2006	Standard
Particulate Matter <10 microns	23.00	23.00	22.00	28.10	USEPA revoked the annual PM_{10} standard in 2006 (effective December 17, 2006). However, the 24 hour standard remains at 150 $\mu g/m^3$.
Particulate Matter <2.5 microns	4.93	7.30	4.63	5.39	15.0 $\mu g/m^3$ is annual standard. 24 hour standard is 98^{th} percentile in a year, averaged over three years, and should be <35 µg/m3

Air masses over the Forest are dominated by trade-winds. The visual quality of the air mass over the forest remains good. Sahara dust and emissions from the Soufriere Volcano and Montserrat cause high peaks of particulate matter which create hazy conditions.

The DFC for air is appropriate to the management situation of the Forest. No regulation or policy has been enacted that affects our capacity to work towards the desired condition. Currently, there is no budget allocated for the Air Program which may become a management concern in the future. The Universidad de Puerto Rico is conducting air quality research on East Peak Mountain.

Though condiditions for Air Quality are optimal, some have risen concerning the programs such as the concern of the effects of particulate matter on Forest evapo-transpirations and rainfall, the impact of climate change on air resources, and the influence of vehicle emissions (large buses) on the Forest when visitation is very high. There is also a newfound interest in establishing air research facilities in the forest.

Program Effectiveness

The Air Program is not effective according to the standards and guidelines of the LMP. Despite the concerns, the monitoring system and survey techniques for air pollution have not been established

Conclusion

Due to the lack of funding for the Air Program, goals, standards and guidelines have not been met. Currently, this is not a management priority, but in the future this will be a concern to the Forest.

Scenery Resources

Introduction

The Forest maintains and enhances visual resources in its planning and management activities. The LMP objective is to protect its tropical scenery along roads, sites, and communities. The landscape, visual variety, and public concern define visual objectives for a landscape element.

Program Implementation

El Yunque Peak and East Peak scenery values were evaluated in FY08. Visual inspections are conducted to determine progress toward the desired visual quality objective.

Program Effectiveness

A proposal to install a new tower next to the Puerto Rico telephone towers was evaluated in FY08. The Forest Completed NEPA on a proposal to construct new communication tower (to address conversion to digital signal in 2008) at El Yunque Peak by TV station WMTJ, Ch 40. Construction was authorized and it is currently in progress. The evaluation indicated no significant alteration to El Yunque Peak's visual quality objective (VQO) of modification.

The East Peak communication site operator was changed from the U.S. Navy to the Federal Aviation Administration. The removal of site material continued in 2008. The site VQO improved.

Conclusion

Visual quality continues to be one of the most important resources of the forest and adheres to the LMP standards and guidelines.

Heritage Resources

Introduction

The goals of the Heritage Resource Program include issuing condition surveys every five years to each identified cultural resource, the performance of an initial scope for the development of a programmatic agreement regarding cultural resources management between EYNF, SHPO and ACHP, and pre-planning the archaeological requirements for two upcoming ARRA projects.

Program Implementation

During FY09, the Heritage Resources Management Program (HRMP) engaged in the performance of the condition surveys to registered cultural resources necessary to keep the standards required for the Priority Heritage Assets (PHA) assigned to EYNF by U.S.D.A. Forest Service Region 8. A total of eight sites were visited. During FY09, the HRMP also engaged the initial phases of a programmatic agreement between EYNF, the State Historic Preservation Office and the Advisory Council on Historic Preservation (ACHP).

The activities performed at this initial stage included the following:

- Verifying the local and federal law features regarding programmatic agreement development and execution.
- Identifying points of contact for consultation.
- Developing of a programmatic agreement draft.

Program Effectiveness

During FY09, the HRMP was successful in achieving all the goals set for the PHA and the programmatic agreement set at the time. The products of those efforts were instrumental in keeping EYNF within cultural resources management standards, the preparation of a final draft to be offered for review to SHPO and the ACHP and the proper and timely utilization of ARRA funds.

Conclusion

The Heritage Resource Program complies with the LMP.

Recreation

Introduction

The Recreation Program receives the largest budget allocation of all the programs. The program provides high quality recreation activities which include picnicking, hiking, water play, driving, scenic viewing, and nature studies. The LMP objective is to ensure public and employee safety. Additionally, the program manages trails, developed sites, and dispersed areas.

The LMP objectives are to:

- Construct 9.7 miles of trails, and reconstruct 7.1 miles of trails
- Provide 160 Thousand Recreations Days (MRVD) on developed sites
- Provide 47 MRVDs on roaded undeveloped sites and 11 MRVDs on Back-Country areas

Program Implementation

The Recreation Program monitors how facilities and experiences are provided. DFC is monitored. The DFC is that a wide range of recreation opportunities are provided. Heavily used undeveloped sites are refined and a variety of trail opportunities are provided with adequate safe parking in trailheads.

Program Effectiveness

Part of the DFC is that developed site capacity, "persons at one time" (PAOT), miles of trail constructed, and re-constructed be maintained to Forest Service standards.

The developed sites capacity during FY08 was 172,000 PAOT. The offered Forest capacity was 526,067 PAOT-days of which 398,254 where managed to standards. Total visitation to the Forest during FY08 was 544,640 visitors at Palo Colorado Recreation Area.

Besides capacity standards, three miles of recreation trails (3.2 %) were maintained to Forest Service standard as well as the completion of the construction of a new developed recreation site, with a capacity of 120 POAT, in the Municipality of Naguabo. The site is called Rio Sabana Picnic Area.

The conditions at El Portal Rain Forest Center continued to be excellent with no accumulation of deferred upkeep as a result of ongoing preventive maintenance and landscaping contracts. Forest visitors enjoy safe and enriching environmental and recreational experiences.

Evaluation of recreation use and facilities determine if objectives are met. Customer surveys were administered and the results were: visitation registered at El Portal Rain

Forest Center for FY08 was 78,017 people this includes 33,527 customers brought to the Forest by outfitters that check in at El Portal but not necessarily enter El Portal. The Forest Visitor fees collected, under the Recreation Enhancement Act, in FY09 were $462,592.25. This is a slight decrease (9.3%) from FY08 when $504,884.25 was collected. Ninety five percent (95%) of the fees collected still remain on site to be used for contracts related to fee collection services, maintenance, landscaping, security and improvement of facilities and services. The Forest Adventure Program, which provides guided hikes by trained Forest Service Interpreters, continued in FY08 with 1,489 customers served and revenues of $10,505. This is a decrease (1.0%) from FY08 when $11,042 was collected.

Conclusion

The Forest works towards LMP implementation. However, the levels of maintenance were low in 2008. The completion of the Rio Sabana Picnic Area helps meet LMP goals for recreation. The budget allocation is not enough to meet maintenance needs. Recreation management at El Verde must be re-aligned.

Wilderness

Introduction

The Caribbean National Forest Act of 2005 (S 272, HR 539) became Public Law 109-18 on December 1, 2005. The law established the 10,000-acre El Toro Wilderness in the EYNF. It is the first tropical forest wilderness in the National Wilderness Preservation System. The primary goal of the LMP is maintaining the wilderness character defined by The Wilderness Act.

The Wilderness Program monitors conditions by protecting the largest remaining example of Puerto Rico's original forest, primary forest, dwarf forest and rare plants and animas as well as providing opportunities for primitive recreation and solitude. These actions are measured in a Limits of Acceptable Change Analysis which requires delimiting appropriate change for physical, biological, and social settings.

Program Implementation

Wilderness condition did not change during FY08. Some trail repairs were done during FY08 at a landslide located along Tradewinds Trail. El Toro Trail is being monitored in relation to erosion problems near El Toro Peak.

The Regional Office reviewed the Minimum Requirements Decision Analysis for the management of the Puerto Rican Parrot in El Toro Wilderness, and concurred with the recommendation of Alternative 2 as the minimum tool necessary.

The Puerto Rican Parrot is an endangered species and requires intensive management to sustain the existing populations, and work to recover the species. Although many of the

management strategies cause a level of trammeling to the wilderness character, these actions are necessary to manage the species recovery program and maintain the only parrot nesting area in the Forest.

Actions requiring Regional Forester decision in this request include the following:

- Using motorized tools for construction of nest entrances (chainsaws) as well as chemicals (baits, pesticides)
- Constructing facilities (observational platforms, artificial nests)
- Overseeing Predator Damage Management (hawks, mongoose, bees)

This list of actions was approved for a term not to exceed five years. This will allow the total impact to wilderness character, and the effectiveness of the species recovery program to be monitored.

Program Effectiveness

Wilderness condition did not change during FY08. Some trail repairs were done during FY09 at a landslide located along Tradewinds Trail. El Toro Trail is being monitored in relation to erosion problems near El Toro Peak.

Conclusion

El Toro Wilderness remains protected as a Wilderness area. The Wilderness Program complies with the LMP and the Wilderness provides essential habitat for endangered species. The endangered species and wilderness characters of solitude, natural, untrammeled, and undeveloped conditions remain the same

Wild, Scenic, and Recreation Rivers

Introduction

On December 2002 river segments were officially designated through the Caribbean National Forest Wild and Scenic Rivers Act (P.L. 107-563, Dec. 19, 2002) as part of the Federal Wild and Scenic River System. Rivers are managed to retain the wild, scenic, and recreational attributes that qualify them for such designation.

Rio Mameyes was assigned as a Wild River for 2.1 miles, as a Scenic River for 1.4 miles, and as a Recreation River for 1.0 miles, for a total of 4.5 protected miles. Rio de La Mina was designated as a Recreational River for 0.9 miles and as a Scenic River for 1.2 miles for a total of 2.1 miles. Rio Icacos was designated a Scenic River for 2.3 miles.

Program Implementation

River corridors retained the attributes that qualified them for designation as Wild and Scenic rivers. The Forest finalized the Comprehensive River Management Plan (CRMP), Environmental Assessment and Decision Memo during FY09.

Program Effectiveness

Upon finalized approval of the Comprehensive River Management Plan (CRMP), the Wild and Scenic River Management Area will implement specific standards and guidelines for each river segment.

Conclusion

The Forest complies with the current LMP standards and guidelines and protecting the Wild and Scenic Rivers' remarkable values.

Interpretation and Conservation Education

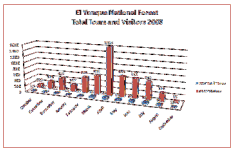
Introduction

The Interpretation and Conservation Education (ICE) sections of the LMP are still current and viable. The standards and guidelines listed in the LMP have served well during the past 5 years. These general conditions are further detailed and up-dated in the *Interpretive and Conservation Education Plan* (finished, approved and submitted to Region 8, in 2008.)

Program Implementation

Completion of the ICE Plan was the most important undertaking during FY 2008 and required partners' collaboration and public involvement. Valuable assistance from the Regional Interpreter and the WO Interpretive Program Manager was obtained to support this multi-disciplinary endeavor.

A total of 558 tours were provided by Forest Service personnel during VIP, Rent-A-Rangers and Kids in the Woods visits.



Program Effectiveness

The program's impact resided on the completion of special events such as:

- Participating in the Water Resources Fair at the Botanical Gardens in Caguas in partnership with EPA, the Universidad Interamericana and the Caguas Municipality.

- Participating in Earth Week Educational activities, partnered with IITF, the Universidad de Puerto Rico Botanical Gardens. media representatives and 12 schools participated

- Presenting the Special Earth Day exhibit, partnered with American Airlines, on El Yunque NF and giving handouts for the public in and exhibited at the Luis Muñoz Marín International airport, AA concourse during a whole month.

- Celebrating "El Yunque Clean-up Earth Day" with multiple partners and exhibitors at the El Portal Rain Forest Center that included participation of 800 volunteers.

- Commemorating National Trails Day and Outdoors Day Celebration with free entrance to El Portal for all visitors and hundreds took free guided tours of the Forest's trails.

- Collaborating with FM Group and Wal-Mart stores carried out presentations on EYNF at their stores while they were promoting sales of their "green" products. For every product sold during these promotions we got a donation. A final $10,000.00 donation to our education fund was received.

Other educational achievements include:

- Developing, reproducing in CD format and distributing 125 copies of the Puerto Rican Parrot elementary school modules to teachers.

- Participating as a contributor for the development of a Puerto Rican Parrot educational curriculum with the Conservation Trust.

- Publishing the El Yunque NF Newsletter.

- Responded to informational requests by twelve organizations, thirty teachers, four researchers and sixty students

- Offering three Customer Services of Excellence trainings to our partners and staff: interpreters and other frontliners, Corporate Source and Eastern National staffs.

Conclusion

The Interpretation and Conservation Education Program complies with the guidelines and goals of the LMP.

Special Uses

Introduction

The Forest administers special use permits to provide opportunities for public benefits. Temporary permits are issued for projects such as recreation events, research, and filming/photography. Long-term permits are issued for activities that last one-year or more.

Program Implementation

There were 95 permits administered in 2008. The following table shows distribution of permits issued:

Use	Temporary	Long-Term
Outfitter & Guides	0	29
Research	3	19
Filming/Commercial Photography	20	0
Telecommunications Facilities	0	8
Recreation Residences	0	4
Electrical Transmission Lines	0	1
Food Concession	0	1
Non-Commercial Group or Recreation Event	6	0
Organizational Camp	0	1
Road Right of Ways	0	1
Water Diversion/Pipelines	0	1

Program Effectiveness

Over 90% of these permits were administered to standards in 2008 which means permits were in compliance, rental fees were collected, facilities or programs were inspected and insurance requirements were met.

NEPA was completed on a proposal to construct a new communication tower (to address conversion to digital signal in 2008) at El Yunque Peak by TV station WMTJ/Channel 40. Construction was authorized and began in 2008.

A revised electronic site plan for El Yunque Peak Electronic Communication Site was prepared and distributed for comment in 2008. This plan updates a previous version issued in 1991 and clarifies guidelines and policies for managing telecommunication uses at the peak. Approximately five proposals to add new equipment to the sites were coordinated during the year.

The US NAVY, who had previously operated radar and communication equipment in the Forest, is proceeding toward the abandonment and clean up of vacated facilities at East Peak. An Environmental Baseline Survey was completed by the NAVY for review by the Forest Service. The Forest Service worked with partners in identifying interest on vacant buildings as the basis to complete an abandonment/demolition plan.

An amendment was completed to extend the term of permit for the Puerto Rico Aqueducts and Sewer Authority (PRASA) while a NEPA process is completed for a long term permit. PRASA is the utility permit holder with the largest number of water intakes on the Forest.

Approximately twenty photo/filming permits were processed in FY2008 including two major motion pictures. These permits generated over $12,000 in rental and permit processing fees that remain on the Forest to help administer this program.

Forest Service assisted the Asociación Puertorriqueña de Interpretación y Educación (APIE) with training seminars conducted in EYNF for tour guide and hospitality industry professionals, students and teachers.

Appraisals for two recreation residence tracts were contracted in FY2008 that will reevaluate the annual rental fees for these permits under CUFFA (Cabin User Fee Fairness Act of 2000).

Conclusion

Lack of funds reduces the program's effectiveness. Demand for recreation and research permits dominated FY08.

Lands

Introduction

The Forest administers its land ownership by consolidating ownership patterns, managing right of ways, and protecting its 72 miles of boundaries. The local planning board has the authority to enforce zoning regulations outside Forest boundaries.

The Lands program monitors its progress by measuring miles of new lines within a ten year and five year period.

Program Implementation

The Forest continues with land acquisition efforts. A Memorandum of Understanding (MOU) was completed and signed with the Puerto Rico Conservation Trust (Fideicomiso de Conservación de Puerto Rico). Under this agreement, the Trust will work with the Forest Service to identify high priority properties for land acquisition. The Trust will work to appraise and purchase these properties from willing landowners and hold the properties until the Forest Service can obtain funding to purchase them from the Trust.

No Land and Water Conservation funds were received for land purchasing. However, the Forest continues to have willing sellers.

Program Effectiveness

Regular funding for land line maintenance continues to be very limited. Funding resources enabled only one mile of land lines maintenance in FY2008. No new miles were established and the wilderness boundary was not established.

Conclusion

Lack of funding reduces the program's effectiveness. There is a need to increase land line management.

Transportation System

Introduction

The Forest implements a transportation system that consists of traffic and parking near major recreation and administrative facilities. The goal of the program is to facilitate public access in balance with the environment and hilly road conditions. The program consists of road improvement, maintenance, and systems planning.

The DFC is that the Forest road system is maintained to standards to serve public demand for access, to meet management needs, and to protect resources in a cost-effective manner. There are annual inspections to monitor roads.

Program Implementation

The plan goals are achieved by:

- Maintaining roads to specified agency standards,
- Protecting natural resources and capital investments,
- Cooperating with federal, commonwealth and municipal transportation agencies, and
- Managing traffic.

Roadside maintenance on PRDOT jurisdiction roads continue to be below desired standards. Major issues include inadequate sight distances and poor visual quality caused by overgrown roadside vegetation. No roads (including system roads) were maintained to standards in FY08. Drainage structures maintenance is also below the desired frequency standard. Additionally, Road PR 191 closed segment between Km 13.2 and 21.3 contributes sediment to the Rio Icacos.

A landslide on PR 9966 within ½ km west of the aviary site has been under repair by Federal Highway since FY05. Construction was not finished FY08, but due to some concerns, the road has not been opened to the public. Palo Hueco Road and FS Road 10 need maintenance.

Program Effectiveness

Though the program increased its transportation planning during FY08, the Forest does not receive sufficient funding to maintain roads and is not authorized to spend the capital received on roads that are not in the FSR inventory or under agreement.

Conclusion

Due to insufficient funding, the Transportation System Program has not been complying with the LMP and standards. Failure to meet the adequate standards can contribute to safety hazards to the public. Also, the Government of P.R. is not investing on its 45 miles roads system within the Forest.

Research

Introduction

EYNF is a site for research that contributes to the improvement and management of tropical forests world-wide. Research is conducted by the USFS, the International Institute of Tropical Forestry (IITF), the Universidad de Puerto Rico, and visiting scientists from other institutions. There were 19 long-term permits for research given during FY08.

The LMP allocates 6,372 acres to Research Natural Areas and 8,498 acres to Manipulative Research Areas. The objective is to continue use of the Forest as site for scientific study.

Program Implementation

The Research Program achieves its goals by:

- Promoting investigative use of the Forest in order to help develop better techniques for tropical forest management strategies,
- Demonstrating concepts and techniques of tropical forest ecology, and
- Monitoring forest conditions.

IITF conducted research on:

- Forest Monitoring, Management and Rehabilitation
- Ecosystems
- Wildlife
- Landscape Ecology
- Global Positioning Systems

The two major users of the Forest as research are IITF and the Universidad de Puerto Rico. The university has a permit to operate a Long-Term Ecological Research (LTER)

Station. The goal of the Luquillo Long-Term Ecological Research Program (Luquillo LTER) is to understand how climate change and land use are affecting the environment of northeastern Puerto Rico. Luquillo LTER includes both terrestrial and aquatic studies, from the peaks of the Luquillo Mountains to the city of San Juan, encompassing strong gradients of both climate and land use. Luquillo LTER research applies to other islands in the Caribbean and similar tropical areas, and it is part of global networks of long-term environmental research in the United States and other countries.

Following are some of the research activities that were applied during FY08 include:

- PR Environmental Quality Board Noise Division and Worcester Polytechnic Institute developed baseline assessment of natural noise on the forest.
- University of Michigan Masters Group Project - Improvements of NF invasive species management by preparing field guide, technical training, NRIS update, and development of invasive plant strategy.
- Universidad del Este hosted World Water Day celebration, a Mongoose Study, and Math and Science Project.
- University of Cordoba (Spain), University of P.R, and IITF celebrated the International Symposium on Fire Management.
- The Southern Center for Wildland-Urban Interface Research and Information Center, the Universidad de Puerto Rico, and IITF initiated a project called "*Integrating Landscape Attributes, Ecosystem Services, and Stakeholder Perceptions and Incentives for Determining Land Use Suitability for Conservation*". The project provides understanding of interrelations between ecosystem services, land use, and people's perceptions and actions that influence the services provided by El Yunque NF.

Additional LTER research results that enhanced management knowledge of Forest condition:

- Hurricane effects simulated by the Canopy Trimming Experiment indicated that canopy trimming reduced abundance, overall biomass, and diversity of litter invertebrates, compared to untrimmed plots, and that microbial community composition changed after the trimming, more from canopy opening than from debris redistribution. It was also discovered that the fungal to bacteria ratios decreased when the canopy was opened, which meant that bacterial biomass increased, and that trimmed plots had lower litter decay rates, at least until canopy closure.

- Landslides research determined that neither slope stability nor organic matter controlled plant colonization. Instead, soil factors (total nitrogen, clay, sand,

water-holding capacity,) and elevation predicted initial plant colonization on landslides.

- Hurricane disturbance research concluded that the effects among trees after 15 years of forest response to hurricane disturbance and aboveground forest biomass returned to pre-hurricane levels, while total species richness, diversity, and stem densities exceeded pre-hurricane levels.

- Census data from the Luquillo Forest Dynamics Plot showed that exotic tree species planted by farmers decades ago and exotic species that have entered the forest naturally have varied in population trends. Four species changed little over the 15- year study period. Six species declined in the interval between Hurricanes Hugo and Georges, then increased again after Georges.

- Studies on climate change determined the optimal conditions for *Cyrilla racemiflora,* Palo Colorado. With a temperature increase of 1.5° C the optimal location of *Cyrilla racemiflora* could shift from 650 m to 900 m in elevation; with and increase of 2.5° C there would be no optimal habitat for *C. racemiflora* in the Luquillo Mountains.

- Stream habitat quality for snails as revealed by RAPs (Rapid Assessment Protocols) decreased in a downstream direction, particularly outside the boundaries of EYNF.

- The range of variation of riparian quality does not predict instream physical habitat quality.

- Results suggest a historic decline in species richness and abundance in the estuarine fish community of the Río Espíritu Santo. There are greater declines in freshwater-tolerant species than marine or euryhaline species. Declines in freshwater inflow to the estuary, due to large-scale upstream water abstractions for municipal use, have increased since 1977.

- Using an Index of Bi-Directional Reverie Connectivity (IBRC), 17 water
  Intakes in streams draining from the Luquillo Mountains were classified as having low, moderate, or high connectivity in terms of shrimp migration. A comparison between two streams showed that the stream characterized by highest water withdrawal by humans had low connectivity, even during wet periods.

- Urban heat temperature fluctuations in San Juan have 5 to 15 times greater impact on electricity consumption than electricity prices or income. Up to 53% of the electricity consumption in urban areas is spent mitigating temperature increases caused by urban heat islands. This amounts to roughly1.9 billion dollars per annum in electricity costs.

- Plant reproduction at El Verde field station and at seasonal variation in the number of flowering and fruiting species was consistent with the hypothesis that seasonal variation in irradiance limits the evolution of reproductive phenologies. There was no evidence for a similar role of moisture availability. Thus, community-wide phenologies revealed a strong signature of seasonal changes in irradiance, even in those forests that exhibit some degree of seasonality in rainfall.

- Data from Puerto Rico show the impact of two hurricanes during interannual patterns of plant reproduction, which obscured any long-term trends in reproductive patterns. In Panama, elevated fruit production occurred during El Niño years, and there has been a long-term increase in flower production by trees (1.1% per year) and lianas (4.5% per year), suggesting an effect of climate change.

- Initial findings showed that there is no male bias in population numbers for three dioecious tree species, *Cecropia schreberiana*, *Dacryodes excelsa*, and *Tetragastris balsamifera*. This contradicts theories suggesting that male-biased sex ratios should occur because females have higher resource needs for producing seeds, and therefore there are likely to be lower numbers of female plants. Also there were no differences in growth rates between males and females in any of the species.

- Bat communities in the Caribbean inter-island distance had a greater effect on compositional similarity of Caribbean bat assemblages than bats on the island area. Differential immigration and hierarchical habitat distributions associated with elevational relief are likely to be primary causes for nestedness of Caribbean bat assemblages.

- Bird populations in Tabonuco Forest type continued to fluctuate annually after a long period of relative stability from 1989-2001. In 2002, bird populations were the lowest that they had been during periods of record. Numbers recovered beginning in 2003 and peaked in 2005. However, another decline was seen in 2006 through 2008. Thus, there is an indication of a cyclic process, but there is insufficient data to evaluate this trend.

- Evidence suggests that the increasing hurricane intensity, declining rainfall in the mountains, and rising temperature of urbanized areas in the nearby lowlands can have significant effects on the ecosystems of the Luquillo Mountains.

The Research Program collaborated with Region 8, the Southern Research Station, El Yunque NF, IITF, and PR DNRE on the *"PR and US Virgin Islands Sub-region Future Forest Project"*. In 2008, the Sub-region team leaders met with natural resources specialists to discuss existing data banks and develop methods to abstract information

from the public as it relates to forest health and its future. Several public meetings were held in Puerto Rico.

Program Effectiveness

Research conducted on the Forest continues to contribute to improvement in management strategies of tropical forests. Completed studies do not preclude future studies in the same area. Researching organizations coordinate and cooperate with the land management unit and comply with NEPA and FS standards and guidelines to prevent conflict. USFS consults with IITF to issue special permits and with LTER scientists periodically.

Conclusion

The Research Program is successful and complies with the LMP, goals, standards and guidelines of EYNF.

Timber Demonstration

Introduction

The Timber Demonstration program consists of a small sustainable timber production.

The Land Management Plan (LMP) goals are:

- Using silvicultural treatments in the secondary forest and using silvicultural treatments compatible with the protection of other resources.
- Buffering the Forest's more delicate ecosystems and rare plants and animals.

Program Implementation

In 2006, a regional review of the program was conducted. The objective was to evaluate conditions on the ground, the level of interagency participation and Forest plan of action. In 2007, the Forest received $37,000 to initiate the program. Silvicultural examination was conducted on 5 acres. No acres were inventoried in 2008 or 2008.

Program Effectiveness

There is limited data to test program validity and plan effectiveness. The Comprehensive Evaluation Report of 2007 proposes an additional educational component.

Conclusion

Timber demonstration is consistent with the LMP of EYNF. No timber demonstration was implemented during fiscal year 2008.

Law Enforcement

Introduction

The Law Enforcement Program consists of patrolling the National Forest land and adjacent areas. The LMP objective is to ensure the public and employee safety. The program protects forest resources, cultural resources, and property.

The law enforcement officers achieved goals by increasing

- Their presence in the Forest,
- Inter-agency cooperation,
- Education, and
- Traffic management.

Program Implementation

There were 1,409 reported events in 2008 according to the Law Enforcement and Investigations Managements Attainment Reporting System.

Year	2005	2006	2008
Warning	501	205	196
Incident	97	239	571
Violation Notice	678	324	642
Total Events	1276	768	1409

The events were the result of increased presence on the Forest and a stronger investigation plan. The law enforcement officers worked with Puerto Rico's Department of Natural and Environmental Resources Ranger Corps on patrolling. There was investigation assistance to US Fish and Wildlife Service, National Park Service, Puerto Rico Police Department, Rio Grande Municipal Police and the Natural Resources Rangers Corps. The program supported search and rescue incidents, criminal background checks, and car clouting investigations.

Program Effectiveness

The program increased presence, cooperative patrolling, prevention, and traffic management in 2008. The program follows the LMP standard and guidelines by training its officers and educating the public during high visitation dates.

Conclusion

The Law Enforcement Program continues to work toward LMP goals.

Budget and Staff

Introduction

The Budget and Forest program manages Forest's budget, financial agreements, collections and incidental funds. The Forest Plan has the objective of contributing to the local economy by:

- Employing a workforce that reflects Puerto Rico's diversity
- Working with local communities and governments to stimulate rural development
- Providing a mix of goods and services

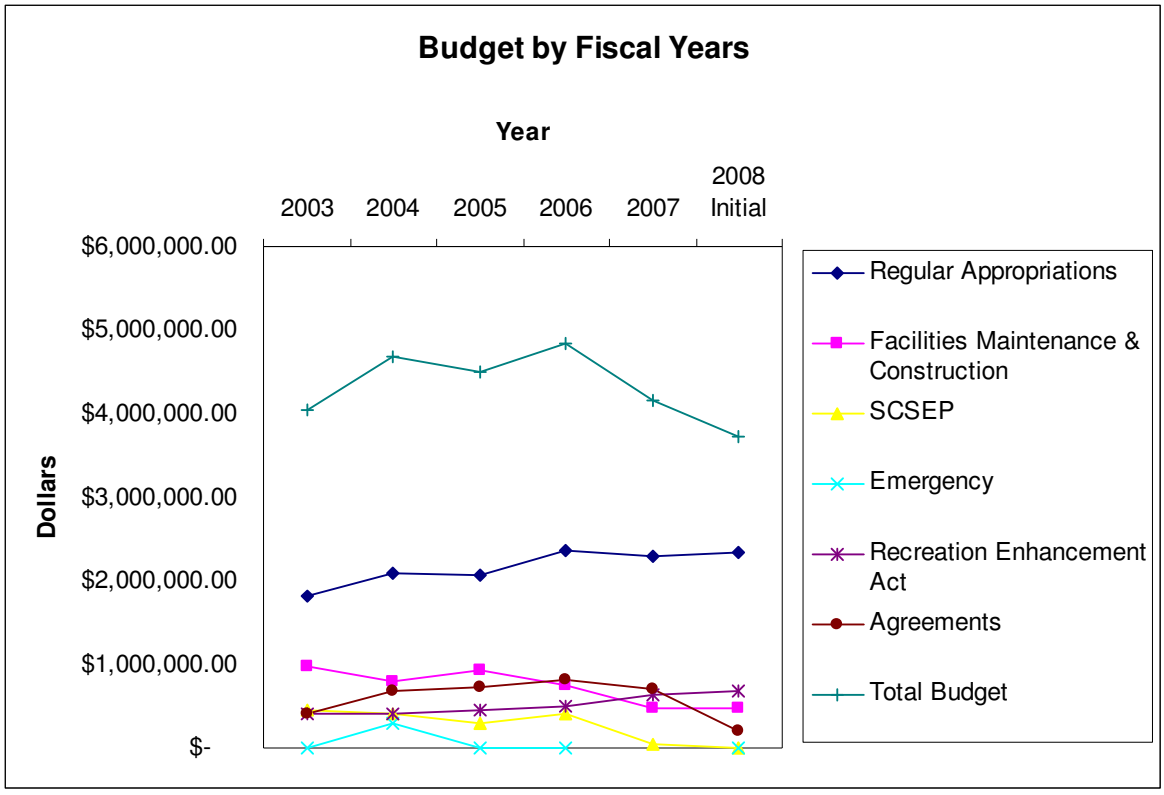
Program Implementation

The purpose of this section is to describe EYNF budget, and assets. The section established a relation between current budget, staff and implementation of the Plan. El Yunque National Forest is a unit with a small economy of scale. The 28,000 acre Forest covers 7 municipalities. The Forest has received an average of 4.3 million dollars per year to operate during the last 6 fiscal years. The initial budget for FY 08 was 3.7 million. Our funding was received in five categories:

Category	6 Year Average (Million $)
Regular Appropriations	2.1
External Agreements	0.7
Recreation Fee Collections	0.7
Facilities Maintenance and Construction	0.7
Emergency Funding (Hurricane and Storm Events)	0.1

The Forest generated $ 202,743 to the U.S. Treasury via collections from Special Use Permits and a total of $ 50,647 was distributed to local municipalities through the Twenty Five Percent Fund Act of May 23, 1908

The Forest FY 08 budget was below FY03 levels by $ 322,258. While Recreation Enhancement Act authorization increased, the loss of the Seniors Program and a minimal increase in Regular appropriations placed a pressure on Forest Planning, Ecosystem Management, Property Management and Customer Services.



Budget Detail

The Forest received an initial budget of approximately of $ 3.7 million dollars for FY08. Funding reductions are expected in Agreements, SCSEP, and Cost Pools.

The FY 08 budget highlights were:

- $ 970,119 received for Recreation/Wilderness/Heritage management.
- $ 689,100 received from recreation areas fee collection.
- $ 499,503 received for natural resource management operations.
- $ 211,876 collected from Cooperative Work Services provided to Federal Agencies.
- $ 20,000 received in donations spending authority.
- $ 0 received for new Recreation trails and/or site construction.
- $ 0 received for Land Acquisitions.

The table provides details of the FY 08 programs, budget allocations and Forest's assets.

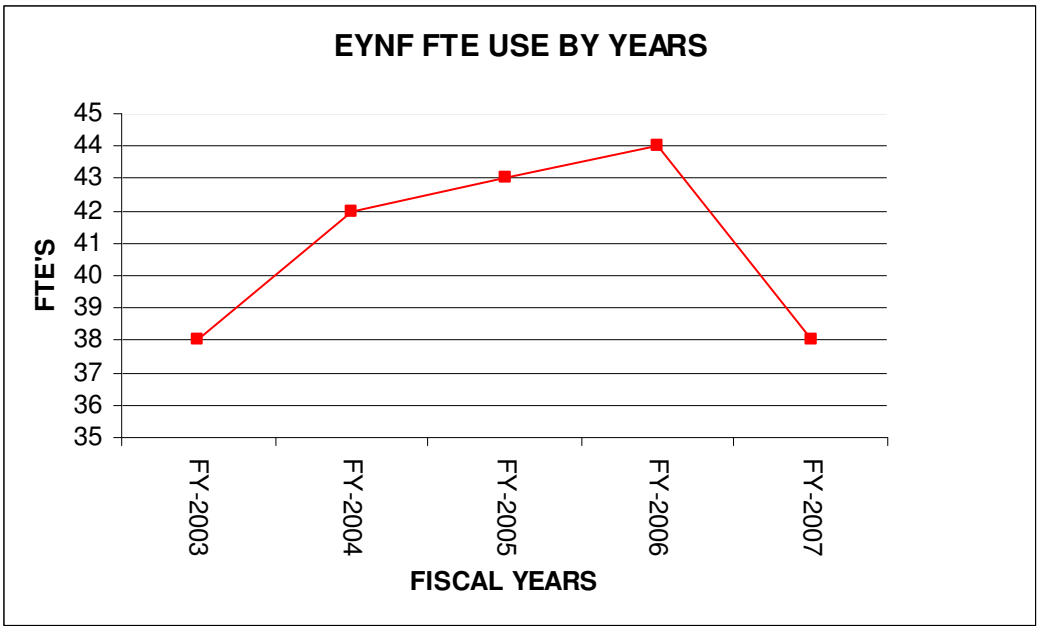
Forest Programs	**FY 2008 Budget INITIAL ($)**	**Assets**
Land Management Planning	52,000	Land Management Plan Approved in 1997
Landownership Management	25,526	73 miles of Boundary Lines
Recreation/Heritage/Wilderness	970,119	1 million visitors 18 Developed Recreation Sites 10,000 Acre Wilderness 2 Wild and Scenic Rivers
Site Specific Special Fund	689,100	El Portal Fee Demo Site
Facility Capital Improvement & Maintenance	310,903	2 Administrative Sites
Roads Capital Improvement & Maintenance	91,000	44.9 Miles of Roads
Trails Capital Improvement & Maintenance	82,223	24.3 Miles of Recreation Trails. 12 Miles of Administrative Trails
Roads and Trails for States	0	Road maintenance
Hazmat Coordination	0	2 Hazardous Waste Active Sites
Land Acquisition	0	Land Acquisition Plan
Quarters Maintenance	1,000	2 Active Sites
Wildlife Management	148,000	Parrot Recovery Program 5 Endangered Birds One Threatened Birds 77 Species of Birds 10 Species of Shrimps 13 Species of Coqui 11 Species of Bats 14 Species of Lizards
Vegetation & Watershed	95,935	175 Species of Trees 8 Endangered Plants

Management		7 acres of Landslide Restoration
Inventory and Monitoring	255,568	1 Annual Monitoring Plan
Forest Fire Management	118,243	150 Fire Fighters Trained
Forest Health Funds	0	Monitoring Pink Hibiscus Mealy Bug and Red Palm Mite
Direct, Support, and Indirect Costs (Cost Pools)	669,853	Executive, Legislative, FOIA and Administration
Law Enforcement	Funded from the WO	4 LEOs
Federal Highways Administration Expense	4,123	Road repairs after Storm Events
Cooperative Work	0	Collection from One Food Concessionaire
Filming Collections	0	Special Uses for Movie and Still Photography
External Reimbursable	211,876	MOU for Natural Resource Management and Archeological Survey with the PR ARMY National Guard

Staff

The Forest operated with a workforce of 33 full time equivalents located on the Forest. There were 5 employees located in a P.R. Army National Guard Training Site.

Workforce has decreased and reverted to FY 03 levels. During that period, the Forest streamlined field operations, increased contracting portfolio and adapted to National initiatives such as Albuquerque Service Center and Information Solutions Organization.



The Forest augmented staff to met work demands by hosting seven participants from 15 to 18 years old (four young women and three young men) under the supervision of Ecosystem and Recreation Units. The seven YCCs worked in several different resources areas accomplishing Recreation and Ecosystem Management projects:

- Collecting trash
- Cleaning picnic shelters and forest signs
- Assisting the repair and maintenance of interpretation structures.
- Surveying wildlife inventories
- Assisting regular and parrot trail maintenance as well as water system maintenance.
- Aiding heavy transit control at the forest during the holidays
- Tree planting
- Working with watershed restoration

Their value was appraised at 20,916.00 dollars and 1,130 accumulated hours rendered.

The Volunteer Program has made great contributions in accomplishing EYNF work priorities for FY 2008. We received assistance of 898 volunteers for an appraisal value of 180,184. And 8511.5 accumulated hours rendered.

Volunteers contributed in a variety of programs such as Recreation, Administration, Ecosystem and Customer Service. Besides doing the same work as the YCC's, the volunteers made additional contributions such as:

- Repairing, maintaining and cleaning all shelters (including picnic shelters)
- Cleaning and painting the bridges, traffic lines and road railing along corridor 191
- Collecting field data(global coordinates) with GPS to prepare GIS maps
- Assisting field survey
- Cleaning and organizing the storage area at El Portal Administrative Office
- Writing and editing work for El Bosque Pluvial Newsletter.
- Upkeeping trail maintenance on La Coca Trail, Angelito Trail, La Mina trail, Caimitillo, and El Yunque Trail as well as cleaning and maintaining Puente Roto
- Mounting the exhibition for outreach presentation of El Yunque National Forest at Hatillo and Mayaquez Municipalities.
- Aiding general office tasks such as photocopying, typing, and organization of the filing system as well as reception areas (answering telephone calls and receiving visitors)

Program Effectiveness

The Plan objectives of contributing to the local economy were achieved. However, El Yunque National Forest is characterized by a wide variety of public services with a constrained budget due to its economy of scale. High use of the National Forest in areas of recreation, special uses, and water result in great demands for stewardship, operations and maintenance. The Forest has survived critical funding periods with additional supplemental hurricane relief funds, reimbursable agreements, fees and volunteers.

Conclusion

The Budget and Staff Program complies with the LMP goal, standards and guidelines.

Conclusion and Highlights for the Fiscal Year of 2008

The fiscal year of 2008 was one of stability. Most programs executed their respective goals with precision and met their goals and objective. Though the majority of the divisions did comply with the LMP standards, some were obstructed by natural hindrances or administrative obstacles.

The Soil and Water program is one which requires further monitoring. Though it complies with the goals of the LMP, the manner in which watershed is approach may become troublesome, even more since the water extraction off the Forest, threatening the hydrological linkages, is increasing. If it is not paid adequate attention, complications will arise and the Soil and Water program may suffer problems which will obstruct the Forest's productivity.

There are also some discrepancies in the animal populations that should be addressed. Even if the aquatic ecosystem of the Forest has a healthy stasis, many populations are not increasing such as the Puerto Rican Parrot and both the Sharp-shinned and Broad-winged hawk (the population stability for the hawks is uncertain). The Coqui populations, as well as other amphibians, are threatened by the rapid movement of a new chytrid fungus. These animal populations should be assessed and monitored further in hopes of maintaining balance and stability.

One of the main problems of the fiscal year was administrative budgeting. Because of the lack of funding, the efficiency of the Recreation, Lands, Special Uses and Transportation programs was decreased and the DFC's of LMP were not met. Though the Air Program does not receive funding whatsoever (making it unable to adhere to LMP standards) and it is not a management priority, it should be considered for restructuring in the future as it will become useful. Future funding should be considered for programs that depend on capital to function.

Other programs are working toward LMP standards. The Recreation program, although the lack of maintenance suffered this year hindered productivity, strives towards its DFC just as the Law Enforcement program.

Besides the problems concerning a few programs, others were extremely successful. The Research program was able to amass vast data, furthering Forest research and knowledge, as well as accomplishing a wide array of academic activities. The Pest Management program fared extremely well, not only meeting LMP standards for pest control but USDA levels as well.

Aside from the aforementioned programs, all the other projects met their individual LMP standards and guidelines. No major administrative change or overhaul should be considered since most programs are functioning properly. Only monitoring and slight revising should be considered for the programs that are not achieving their DFC